P802.1DG Status Update
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New (pre-existing) potential Use Cases

Sources:

- IEEE 802.1 has 35 pre-existing presentations:

  2011=8 presentations, 2012=5, 2013=10, 2014=5, 2015=4, 2016=3

  (https://1.ieee802.org/tsn/802-1dg/#IEEE_8021_TSN_Presentations)

- IEEE SA Ethernet & IP @ Automotive Technology Day

  2017=20 presentations, 2018=21

  (https://1.ieee802.org/tsn/802-1dg/#IEEE-SA_Ethernet_IP_Automotive_Technology_Day)

- Avnu Alliance

  11 interesting whitepapers

  (https://avnu.org/whitepapers/)

Summary of Use Case research

As Editor of P802.1DG and long time member of IEEE 802.1 AVB/TSN I have reviewed 35 IEEE 802 presentations given between 2011 and 2016 to get a feel for what is desired by the Automotive community.

After doing a preliminary review of each of those presentations I extracted an initial list of TSN related features and included them in this slide set.

I encourage readers of this slide set to review those presentations to verify nothing has been missed or misinterpreted.

Don P. will do a more exhaustive review to update the Consolidated Use Cases document seeking, whenever possible, the original author's agreement to Don's interpretation of the needs. The Consolidated Use Case document will be periodically reviewed with the Task Group to arrive at some level of non-binding consensus.

Development of the Draft

Focus on the following:

1. Editor knows TSN quite well. Editor knows some things about automotive, but is NOT an automotive expert. YOU are the automotive experts. Editor needs your input.
2. There are questions to be answered on the following slides. Answers can be discussed today or on the email reflector (stds-802-1-l@listserv.ieee.org).
3. Anything else to consider? If so, please create a presentation to share with the group.
4. Anywhere else to look for Use Cases and Requirements?

Review the 35 IEEE 802.1 presentations

The remaining slides contain the TSN features extracted from the presentations mentioned previously. The categories (in no particular order) are:

- General concepts
- Time Synchronization
- Latency
- Redundancy
- Security
- Fault handling
- Reservations

During my review of the presentations the following two quotes were discovered:

“as much as possible for as little as possible”

“make expensive features optional”

General concepts

1. Converged backbone (control and multi-media)
2. Heterogenous network cross-communications ("*Ethernet as backbone*"):
   - LIN, CAN, FlexRay, MOST, Ethernet
3. Cable harness weight
   - Topology: star vs. daisy-chain vs. ring vs. mesh vs. ???
4. Data integrity (EMI associated with higher speeds on copper)
   - Outside of our scope?
5. Start-up time vs. safety requirements
   - Fast start-up without full TSN support?
   - Warning chimes vs. backup camera
6. Scalability vs. Complexity

TSN feature: Time synchronization

Time synchronization

- Faster startup sync
- Wall time vs. Working clock
- Cross-medium time gateways (e.g.: CAN-Ethernet, LIN-Ethernet, etc)
- Clock redundancy
- BMCA, multiple domains, custom solutions
- Pdelay needed?

TSN feature: Latency

Latency and jitter requirements

- Preemption, traffic shaping, network speed
- Urgency Based Scheduling (i.e. Asynchronous Traffic Shaping)

TSN feature: Redundancy

Reliability/redundancy with quick recovery

- How fast is “quick”?
- How many packets in flight?
- “out-of-order delivery” vs. “in-order delivery”
  - In-order delivery implies buffering with a side effect of packet bursts
- Duplicate flows vs. fast (?) failover with packet loss
- Duplication/elimination points in the network (switch vs. end station)
- Limp home mode

TSN feature: Security

Secured zones (e.g.: powertrain, chassis, body, safety, infotainment)

- Are VLANs enough?

Network/device security

- 802.1AE Media Access Control (MAC) Security
- 802.1X MAC Security Key Agreement Protocol (MKA) Extensions
- 802.1AR Secure Device Identity

TSN feature: Fault handling

Fault detection and handling

- Silent fail, masquerading, duplication, babbling idiot
- Ingress policing
- Isolation (blocking) vs. tolerance vs. containment
- If blocking is decided, should we block stream? Block port? Block entire device?
- Error reporting

TSN feature: Reservations

Bandwidth requirements

- Different link speeds in each direction (e.g.: camera data (hi) vs. camera control (low))

Bandwidth reservations

- Static vs. Persistent vs. Dynamic
- Number of streams?
- Are persistent/dynamic reservations (e.g.: SRP) worth the protocol complexity?

Questions?
Thank you!